

REMARKS

Claim Rejections

Claims 1, 5-7 and 11-13 are rejected under 35 U.S.C. § 102(a) as being anticipated by Mitsui et al. (U.S. Patent No. 5,418,635). Claims 2-4 and 8-10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Mitsui et al.

Drawings

It is noted that no Patent Drawing Review (Form PTO-948) was received with the outstanding Office Action. Thus, Applicant must assume that the drawings are acceptable as filed.

New Claims

By this Amendment, Applicant has amended claims 1, 3-4, 7 and 9-10. Claim 1 has been amended to obviate the objection set forth in the outstanding Office Action. It is believed that the amended claims now specifically set forth each element of Applicant's invention in full compliance with 35 U.S.C. § 112.

The cited reference to Mitsui et al. discloses a liquid crystal device with a reflective substrate having a glass substrate (11), a resist film (12) coated on the glass substrate, a photomask (13) placed above the resist film while being exposed to light, forming a plurality of convex portions (14a', 14b') developing the glass substrate and resist film, heat treating the convex portions, treating the glass substrate with a polymer resin film (15), and forming a pixel electrode (19) on the polymer resin film. The pixel electrode is electrically connected to a drain electrode (26) by a contact hole (29).

Mitsui et al. teaches a method for forming a plurality of convex portions in shelves (Fig. 2), the pixel electrode being electrically connected to the drain electrode by a contact hole, but Mitsui et al. does not teach applying a mask with a plurality of independent spot patterns and a contact hole pattern to design patterns on the photosensitive layer in developing the photosensitive to form wave shaped surfaces thereon and a contact hole thereon. As to claim 1, Mitsui et al. does not teach performing a defocused exposing procedure by applying a mask with a

plurality of independent spot patterns and a contact hole pattern to define patterns on the photosensitive layer, nor does Mitsui et al. teach developing the photosensitive layer to partially remove photosensitive layer from first area to form wave shaped surfaces thereon and to partially remove the photosensitive layer of said second area to form a contact hole thereon. As to claim 7, Mitsui et al. does not teach performing a patterning procedure by applying a mask with a plurality of independent spot patterns and a contact hole pattern to define patterns on the photosensitive passivation layer, nor does Mitsui et al. teach developing the photosensitive passivation layer to partially remove the photosensitive layer of the first area to form wave shaped surfaces thereon and to partially remove the photosensitive material of said second to form a contact hole thereon.

Mitsui does not disclose performing the defocused exposing step to define the contact hole and wave shaped surfaces on the photosensitive layer simultaneously, nor does Mitsui disclose the mask with plural independent spot patterns and a contact hole pattern as shown in Fig. 5 of the present invention which is applied to perform the defocused exposing step.

Referring to Figs. 3a-3e of Mitsui, the disclosed method to make pixel electrode 19 having wave shaped surfaces comprises the steps of:

- (1) coating a resist film 12 on the glass substrate 11 (Fig. 3a and col. 6, lines 7-10);
- (2) using the mask 13 to expose the resist film 12 (Fig. 3b and col. 6, lines 33-39);
- (3) developing the resist film 12 to form the minute convex portions 14a' and 14b' with square upper corners (Fig. 3c and col. 7, lines 52-60);
- (4) heat-treating the glass substrate 11 to soften the convex portions 14a' and 14b' (Fig. 3d and col. 7, lines 15-19);
- (5) spin coating the polymer resin film 15 onto the glass substrate 11, wherein the polymer resin film 15 formed on the convex portions 14a and 14b has the continuous wave shaped surface (Fig. 3e and col. 7, lines 20-30);
- (6) forming the pixel electrode 19 on the polymer resin film 15, wherein the pixel electrode 19 can duplicate the shape of the lower film 15 to have wave shaped surface thereon (Fig. 3e and col. 7, lines 31-42).

Comparative to the present invention, Mitsui use two layers to constitute the wave shaped structure, the resist film 12, and the polymer resin film 15. That means it needs to perform two depositing procedures for forming the resist film 12 and the polymer resin film 15 respectively. In the present invention, only one photosensitive layer 66 is used and only one depositing procedure is done as shown in Fig. 4.

Further, according to the method proposed by Mitsui, it is necessary to perform two lithography steps, the first to define the convex portions 14a' and 14b' as shown in Fig. 3c, the second to define the contact hole 29 in the polymer resin film in Fig. 2. Because the polymer resin film 15 is spin coated onto the glass substrate 11 as mentioned in the specification of Mitsui, it must use an extra etching step for defining the contact hole 29 in the polymer resin film 15 to expose the drain electrode 26 shown in Fig. 2.

The method disclosed by Mitsui is incapable of simultaneously forming the contact hole 77 and the wave shaped surface 75 on the photosensitive layer 66 in one lithography step as shown in Fig. 6 of the present invention.

It is further noted that Mitsui needs to perform an extra heat-treating procedure to soften and bend the square upper corners of the convex portions 14a' and 14b' for forming the convex portions 14a and 14b with the smooth wave shaped surfaces.

Mitsui does not disclose the mask 72 having the plural independent spot patterns 68 and a contact hole pattern 70 as shown in Fig. 5 of the present invention, or the step of performing a defocused exposing step to define the contact hole and wave shaped surfaces on the photosensitive layer simultaneously.

It is axiomatic in U.S. patent law that, in order for a reference to anticipate a claimed structure, it must clearly disclosure each and ever feature of the claimed structure. Applicant submits that it is abundantly clear, as discussed above, the Mitsui et al. does not disclose each and every feature of Applicant's amended claims and, therefore, could not possibly anticipate these claims under 35 U.S.C. § 102. Typically, Mitsui et al. does not teach using a mask with a plurality of independent spot patterns and a contact hole pattern to define patterns on the photosensitive layer forming wave shaped surfaces the contact hole from the photosensitive layer

in a single developing step. Absent a specific showing of these features, Mitsui et al. cannot be said to anticipate Applicant's amended claims under 35 U.S.C. § 102.

As noted by the Examiner, on page 4 of the outstanding Office Action:

...Mitsui et al. does not explicitly disclose a range for the sizes as well as the shapes of the independent spot patterns.

It is further submitted that Mitsui et al. does not disclose, or suggest a modification of the specifically disclosed structure that would lead one having ordinary skill in the art to arrive at Applicant's claimed structure. Thus, it is not believed that Mitsui et al. renders obvious any of Applicant's amended claims under 35 U.S.C. § 103.

In Mitsui, it is required to deposit two films of resist film 12 and polymer resin film 15; to perform two steps of lithography for defining the convex portions 14a' and 14b' and contact hole 29 in the polymer resin film 15 respectively; and to use an extra heat-treating procedure for bending the convex portions 14a' and 14b'.

However, according to the method proposed in the present invention, it only needs to form a photosensitive layer 66 on the substrate 10 (Fig. 4) and to use the mask 72 illustrated in Fig. 5 to perform just once defocused exposing procedure, the contact hole 77 and wave shaped surface 75 can be formed simultaneously on the photosensitive layer 66. Thus, there is no need to form the contact hole and wave shaped surfaces using two different masks and two exposing steps as in Mitsui, thereby shortening the cycle time and increasing the throughput.

In the present invention, the distance d2 between two adjacent independent spot patterns 68 is less than the resolution of the exposure system, so after the development procedure the photosensitive layer will not be defined and divided into several independent bumps, and just has the wave shaped surface formed thereon. After that, a reflow procedure is applied to smooth the surface of the photosensitive layer and simultaneously to adjust the inclined angle of the wave shaped surface.

On the other hand, the distance d1 between the independent spot pattern 68 and the contact hole pattern 70 is larger than the resolution of the exposure system, thereby the pattern 70 defined onto the photosensitive layer can form the complete contact hole 77 therein to expose the below electrode 64 as shown in Fig. 6. And

Application No. 10/040,484

because the size of the contact hole pattern 70 is larger than that of the independent spot pattern 68, even after the reflow procedure, the contact hole 77 still can effectively penetrate through the photosensitive layer and expose the electrode 64.

Summary

In view of the foregoing amendments and remarks, Applicant submits that this application is now in condition for allowance and such action is respectfully requested. Should any points remain in issue, which the Examiner feels could best be resolved by either a personal or a telephone interview, it is urged that Applicant's local attorney be contacted at the exchange listed below.

Respectfully submitted,

Date: August 7, 2003

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